

Multi-Cell Thermal Battery, Phase II

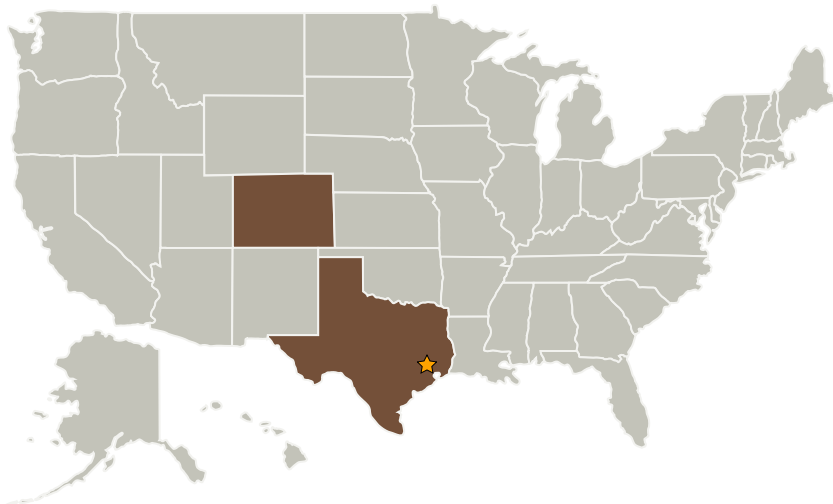
Completed Technology Project (2009 - 2011)



Project Introduction

The multi-cell thermal battery (MCTB) is a device that can recover a large fraction of the thermal energy from heated regolith and subsequently apply this energy to heat up cool regolith. The individual cells of the MCTB contain a thermal storage media that is specifically designed for optimal performance at a given temperature range. Each of these cells is charged with thermal energy from hot regolith that has been used in a lunar ISRU application. Once the MCTB is charged, the heat is transferred from the battery to newly harvested regolith. In this manner over 85% of the heat can be transferred from the expended to the new regolith. This is a large improvement especially considering that this reduces the heating requirement to produce 1000 kg of O₂ from lunar regolith from an average of 1 kW to only 0.15 kW (assuming 3% O₂ recovery by weight). The other irreducible power consumption of lunar ISRU O₂ production is electrolysis which consumes at least 0.3 kW. Hence, using the MCTB decreases the irreducible power consumption of lunar ISRU by 65 %.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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| Organizations Performing Work | Role | Type | Location |
|-------------------------------|-------------------------|--|--------------------|
| ★ Johnson Space Center(JSC) | Lead Organization | NASA Center | Houston, Texas |
| Pioneer Astronautics | Supporting Organization | Industry Historically Underutilized Business Zones (HUBZones) | Lakewood, Colorado |

Primary U.S. Work Locations

| | |
|----------|-------|
| Colorado | Texas |
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Project Transitions

**October 2009:** Project Start**April 2011:** Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.2 Heat Transport